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A MONTHLY MAGAZINE

OF

ORIGINAL AND SELECTED ARTICLES,

BEARING PRINCIPALLY ON THE

ROCKY MOUNTAIN SECTION,

WITH A SUMMARY OF NEWS.

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"OUT WEST" PRINTING AND PUBLISHING COMPANY.

PROSPECTUS.

OUR WEST aims to be the Magazine of the *Rocky Mountain Section*, and of Colorado especially, as its prominent representative.

Nature has marked out this Section by many peculiarities (geographical, topographical, climatic, etc.,) as a distinct one, and it seems appropriate that it should have a magazine distinctly its own.

For such a publication it will yield abundant topics of interest, for it is a wide field in which to reap, and (to the rest of the world) comparatively an unknown one.

Its physical characteristics alone—its Peaks and Parks and Passes, its Glens and Cañons, its Groves and Forests, its Lakes and Streams and Waterfalls, its Table-lands and its Valleys, its sweeping Plains—might furnish themes for almost endless description.

The researches of topographers, geologists, mineralogists, botanists, and other scientists, are daily unfolding new wonders, the full record of which would require many volumes.

The deeds of daring, the privations and the sufferings of Pioneers in the not far distant Past; the customs and the folklore of the red men who have so long held this vast region for their own, but who are so rapidly disappearing before the on-coming flood of Civilization; the struggles between the old inhabitants and the new; these and kindred subjects can furnish many a thrilling and romantic chapter.

The evidences of an ancient civilization—though scanty as yet—give promise that ere long, the history of a still older race will await the chronicler.

These subjects it is intended shall all find a place, from time to time, in the pages of **OUR WEST**.

The Past, however, must, to a great extent, give way to the Present.

The white man has come to take the place of the red man, and is stamping the super-scription of his kingship on the face of the land. The scream of his locomotive wakes the echoes which a while ago multiplied the war-whoops of the savage. He has turned the fruitful waters upon the Valleys and Plains over which the Indian so lately hunted and fought, and has made their barren wastes to "smile with fields of wavy corn." He has built Churches and Schools and Business Blocks where, but a few years since, the squaws put up the wigwags for their braves. His sheep and cattle are feeding on the range of the antelope and the buffalo. His mining camps are driving the bear and the panther from their lairs in the mountains. And day by day the old order of things is giving place more and more to the new; the Stone has been thrown into the water, and the circles are spreading outwards with continually widening reach.

To present a reflex of this progress of Civilization in its various branches, will be a chief part of our purpose, and to help it forward, to some extent, will not be beyond our ambition.

In brief, it will be sought to make **OUR WEST** such that anyone reading it will gain a full and accurate idea of the Rocky Mountain Section in all its phases—its geography, topography, scenery and climate, its resources, its capabilities, and its wants, its industries and enterprises, its associations and prospects.

To this end, the Editor has already secured the assistance of several contributors, who are prominently identified with the Rocky Mountain Section, and who are eminently fitted, by experience or study, to furnish contributions of interest and value. He trusts that many others, similarly qualified, will be induced to give their aid, and he commends the enterprise to their good will.

Free use will be made of articles of value appearing in other publications, and these Selected Articles, thus brought together from various sources, will, it is believed, be one of the most valuable features of the Magazine.

A short Summary of News will also be published each month. In this, the aim will not be to present a complete chronicle of events, but rather to give a selection of such items of news as will be a fair index of what is going on.

Whilst **OUR WEST** has been made sufficiently large to afford ample space for these various features, it has been thought well to keep it, for the present, within comparatively narrow limits, it being preferable that it should "grow up with the country" rather than that it should start out on too ambitious a scale, only to afford one more example of the rule that "pride goes before a fall."

J. E. LILLER, Editor.

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OUT WEST.

NEW SERIES.]

SEPTEMBER, 1873.

[Vol. 1, No. 3. —

THE SUMMIT PLATEAU AND THE ROCKY MOUNTAINS.

PART II.

I have briefly indicated the course which the general rise or upheaval of the Continent has taken. We will now consider the excrescences and irregularities on its surface.

The entire country between the Alleghanies (Appalachian Range) and the Summit Plateau, which extends from the Gulf of Mexico in the South to the watershed of Hudson's Bay in the North, is mainly one vast flat for thousands of square miles in the Prairie States east of the Mississippi; more or less undulating on the Western Plains, most depressed in the valleys of the Mississippi, Ohio, and Missouri, and only sufficiently elevated at its northern limit to determine the flow of the waters in the two opposite directions, north and south. Scarcely a trace of volcanic disturbance is to be seen in all this vast region. On the Summit Plateau, however, mountains for the first time rise from the plains. All along the axis of *general elevation*, independent ranges, varying considerably in direction, height, and extent, have been piled up in great apparent confusion, while here and there some very lofty peaks mark the probable centre of volcanic action in special localities.

To the question, Where is the central range of the Rocky Mountains? I confidently answer, Nowhere! There is no continuous central chain whatever. It appears to me, on the contrary, from my own observations, and from diligently examining the explorations of others, that the so-called Rocky Mountain System, from the northern boundary of the United States to their southern termination, consists usually of two chains of mountain ranges, occupying the eastern and western edges of the Summit Plateau, and separating it from the plains on either side.

These eastern and western chains communicate by means of transverse ridges at irregular distances, thus cutting up the Summit Plateau lying between them into a succession of isolated plains or "parks" of great elevation.

The word "park" in Rocky Mountain phraseology, has a specific signification, and is used exclusively to designate those lofty, well-watered plains, or prairies, to be found all along the Summit Plateau, shut in on all sides by mountains.

Secondary ranges radiate from the primary chains, and jut out into the less elevated plains, east and west, along the whole extent; while the surface of the central or park districts is not unfrequently much disturbed by lesser ranges piled up in endless confusion.

The "Continental Divide," by which I mean the water-parting of the Atlantic and Pacific rivers, passes through sometimes the western chain and sometimes the eastern, crossing and recrossing the Summit Plateau by means of the transverse ridges. Had the Summit Plateau been capped by one vast central pile, this would not have been the case.

Again, the points which show signs, by their lofty peaks, of the most intense volcanic action, and, by the ranges radiating from them, that they were the centres of mountain-making forces, are always to be found along the western or eastern main chains, at the edges, and not in the centre of the Summit Plateau, which represents the backbone of the general upheaval of the Continent.

Such volcanic peaks are Fremont's Peak, Laramie Peak, Long's Peak, Mount Lincoln,* Mount Gray, Pike's Peak, and Spanish Peaks, none of

* On a transverse ridge, though nearly central.

which have a central position on the Summit Plateau.

The general direction of the Dual Main Chains is the same as that of the Summit Plateau upon which they rest. From the 49th to the 42nd parallels, it is north-west and south-east; from the 42nd to the 38th, nearly north and south. From about this parallel the main chains part company. The course of the eastern ranges is mostly north and south, until they become lost in the detached mountains between the Rio Grande and the Pecos River; the western ranges run more west of south, until they sink below the surface in the great Madre Plateau of New Mexico.

All the innumerable ranges of hills and mountains which cover the regions west of the main chains, and east of the Sierra Nevada, and which do not obviously jut out from the former, ought not to be placed under the head of the Rocky Mountain System. Such a classification only causes confusion, and is not warranted either from the physical relations or geological formation of the mountains themselves.

To establish the truth of the above assertions with respect to the Rocky Mountains and their general topography, I must refer to the map, while I very briefly point out the facts which have led me to such conclusions.

Commencing at the north, near the British-American frontier, the two main chains are represented by the Bitter Root Mountains on the west, and by the Flat Head Mountains on the east. A transverse range, the Big Hole Mountains, unites these ranges a little south of the 48th parallel.

The Park Region thus enclosed is fully one hundred miles across, by thrice that distance in length. It is traversed in all directions by lesser ranges covered with pine, and enclosing parks and prairies, forests and lakes.

The general slope of this country is towards the northwest, and the only outlet through which the drainage of the entire district can escape is in that direction. The stream there formed is known as Clark's Fork, and is the main branch of the Columbia River.

The Continental Divide, having crossed the

Summit Plateau through the Big Hole Mountains, traverses the western chain in a southeasterly direction for about one hundred miles, where it crosses the Summit Plateau for a second time, at right angles, passes into the Wind River Mountains, and then resumes its former general direction southward. The eastern chain is here represented by hills forming the local divide between the Maddison and Jefferson Rivers, which are the terminal forks of the Missouri. The central, or park district, much resembles that separated from it by the Big Hole transverse range. It is hilly, heavily timbered in places, and contains several fertile parks, such as Big Hole Prairie, Horse Prairie, and Hooked Man's Park.

The duality of the chief ranges is not clearly defined for the next hundred miles; nor is this surprising, considering that in this section one of the main divides of the Western country—viz: that between the waters of the Gulf of California and those of the Northern Pacific—joins the mountains on the Summit Plateau. A little north of Fremont's Peak, the most lofty summit of the Wind River Range (elevation 13,570 feet) the Bear Mountains jut out towards the Great Wahsatch Range, as a spur from the Rocky Mountain System. Along this divide the ridge passes—the waters destined for the Gulf of California, which flow south, being represented by the heads of Green River, the northern branch of the Rio Colorado; and those of the Northern Pacific by the terminal branches of Lewis Fork or Snake River, which latter flows into the Columbia.

To the northeast of the Wind River Mountains, and rising from the plains, are the Big Horn, the Snow, the Girdle, and other "lost mountains," our present ignorance of which, both topographical and geological, will not allow us to group them into any general system.

Southeast of the Wind River Mountains, and forming their southern continuation, runs a range of hills upon the western edge of the lofty Summit Plateau, representing the western main chain. Along this range passes the Continental Divide, having South Pass, Bridger's, and others in its course. The eastern main chain is here called the Black Hills; that part of the Summit Plateau which intervenes is the level park district, known as the Laramie Plains.

The Continental Divide continues its southeasterly direction for about fifty miles from Bridger's Pass in the western main chain, then passes due south for another fifty miles, and then crosses the Summit Plateau from the western to the eastern main chain. The portion of the plateau north of this transverse range (for such is the divide here) is known as North Park; it is cut off from the Laramie Plains by a minor range, and is shut in along its eastern boundary by the eastern main chain, a spur of which juts up into the Laramie Plains, as the Medicine Bow Mountains.

The only outlet for the drainage of North Park is through a cleft in its northern boundary. Through this the waters run, forming the north fork of the Platte River. This stream traverses the Laramie Plains, passes out at their north-western corner, winds eastward around the Black Hills, and finally crosses the plains of Nebraska towards the Missouri River.

Having crossed by the southern mountain boundary of North Park into the eastern main chain, the Continental Divide lies now on the eastern side of the Summit Plateau, but only through 1°; it then crosses again from Long's Peak to the western chain, forming three sides of a square, enclosing the next park, Middle Park, which, of course, is drained by streams flowing west. These streams are the headwaters of the Grand River; they escape through a cleft in the western main chain, and, uniting eventually with Green River, from the Great Colorado of the West.

The next section of the Summit Plateau is South Park; it is hemmed in on all sides, like the other parks, by mountains, the eastern and western main chains being well defined. The Continental Divide traverses the northern and western ranges which bound the park. The drainage is collected into two streams, and passes through the other two sides; that through the eastern forms the south fork of the Platte, while that which escapes through the southern becomes the Arkansas River.

South of the South Park the two main chains of the Rocky Mountain System are never again united by transverse ranges, but diverge very considerably. In the fork thus formed rise the

headwaters of the Rio Grande, and, as the ranges diverge, so does the valley of this important river widen out. High up in the fork, the Summit Plateau is called the St. Louis Park, and, with its crystal streams, its corn-fields, and its lake abounding in trout, is well deemed the most beautiful of all the Parks. It is no less than 7,500 feet above the sea; the mountains bounding it on the east are called the Sierra Blanca, and those on the west the Sierra de San Juan.

Gradually the Summit Plateau widens out, and sinks to the southward, until it can no longer be recognized as a distinct table-land.

The eastern chain of the Rocky Mountain System terminates a few miles southeast of Santa Fe, scarcely reaching the 35th parallel; for the long narrow ranges of gold and silver-bearing mountains, the Placer, Zandia, Manzana, Soledad, Organ, etc., which form an almost unbroken chain along the eastern side of the Rio Grande Valley, should not be classed in the Rocky Mountain System; they are different in formation and more recent in date.

The western chain continues from South Park, to represent the Continental Divide. In it, different ranges have received special local names, but all are spoken of in general terms as the "Sierra Madre of New Mexico." How many, or how few, of these ranges, from the Sierra de San Juan north of the 49th parallel to the Miembres and Burro Mountains, which form the northern boundary of the Great Madre Plateau south of the 32nd, ought to be considered as southern continuations of the Rocky Mountain System, must remain undecided until the country north of Mount Taylor is better known. I expect that a well-marked geological separation will then be found to exist between the more recent volcanic formations of which that mountain and its southern continuations are composed, and the far older structures and primitive upheavals characteristic of the true Rocky Mountain System.

W. A. BELL.

The cattle growers in the counties of Pueblo and Huerfano recently held a convention at Greenhorn and organized a "Cattle Owners' Protective Association," the prime object of which is to keep sheep owners from grazing their sheep on the public lands which the cattle owners wish to use. They propose to apply to the Legislature this winter for a law to that effect. The reasons given for the proposed action are that the cattle owners have used the lands for years, and that cattle will not graze where sheep feed; consequently that the latter have no right to drive the former away.

MEXICO AND THE MEXICANS IN 1872.

NO. 3.—COLIMA TO GUADALAJARA.

At three a. m., on the third of April, our host woke us up, and, in half-an-hour, all was bustle and confusion in the house. By five everything was ready, and our start was one of the prettiest scenes I ever saw—pack-mules kicking and twisting; horses held by armed servants; our party all armed with Henry rifles and revolvers; the crowd of lookers-on standing gaping around; Señor H. on his grey pony, with a huge umbrella strapped to his saddle; Ali, the Newfoundland dog, bustling round to see that all was right; and the first crimson streaks of sunshine behind the old bell-tower.

We ladies went for the first twelve miles in the old carriage that brought us from Manzanillo. When we had traveled that distance we changed horses; but, as the fresh pair had never been in harness before, and as the harness was mostly tied together with bits of string, we soon decided to get upon our mules before the place where the carriage-road stopped. The little mules paced pleasantly along at about four miles an hour on an average, and, passing through fields of maize and frijole beans, all under irrigation, we came at eleven to the Hacienda de Quesaria, 3,850 feet above the sea.

Here we had breakfast, and went to see the sugar-mill. But the most remarkable product of the estate is "Chicken Wine." As any-one may imagine, we greeted the member of the party who made the discovery with shouts of derision, but he stuck to his statement, and soon a bottle with "Vino de Pechuga" (the breast of a chicken) on the label was produced. We tasted the decoction, and found it very bad rum, with no perceptible taste of feathers. Three barrels, worth \$36 the barrel, are made daily, and two chickens are boiled in every four gallons of the wine. Such is the fact—but the reason why remains a mystery to this day.

We set out again at one o'clock, quite an imposing array,—seven armed servants, five pack-mules, and seven of ourselves. Just out of Quesaria, we heard the road was dangerous from

bands of robbers, and we kept a sharp look-out crossing two deep Barrancas or Cañons before reaching the village of Tonila.

After Tonila we got on the slopes of the Volcano de Colima, which towered above us with smoke coming from a fissure quite low down the side. The country was open and bare of trees, except along the streams, which all seem to cañon here like those of Colorado. We were also pleasantly reminded of our Northern country, by the re-appearance of the Spanish Bayonet. Here it grows into a plant twenty feet high with many branches and fine heads of flowers, and is used as a hedge round the fields.

A four hours' ride brought us over some small Barrancas to the Hacienda of San Marcos, where we were most hospitably received by the owner, and stayed two nights to rest, and make examinations of the country around. The estate is chiefly devoted to sugar culture, and, as it was the middle of "crop-time," when we were there, the whole place presented a most animated scene. The "Alto" (literally "high place,") a small mound of rock about 100 feet high, is surmounted by a beautiful old Spanish Castle, reached by a long flight of steps from the Patio below: here the family live when they are in the country. All around the Patio are low buildings inside strong walls—the sugar mills, stables, corral for mules, a small church, and a long suite of rooms in which we were lodged. The morning we left we had to get up at three, but were amply rewarded by the picture which met us on coming out of our rooms. The whole court was lit up by two huge fires, in cressets, to light the men in the mill, as they were grinding cane all night, and illuminated the walls and towers of the Alto. Close by, our servants were packing and saddling the mules and horses under the orange trees; while some sleeper was still swinging in his hammock at the end of the long piazza.

At four we started down a road between fields of sugar-cane hedged by bananas, and almost immediately found ourselves on the brink of one of the famed Barrancas. To any one accustomed

to the magnificent Cañons of Colorado, I must say that these Barrancas, though very grand, are certainly disappointing. But we, perhaps, are hardly fair judges, as we passed them in the dry season; even from the flowers and ferns which we then saw, we got a faint idea of the magnificent vegetation which covers their sides during the rainy season, when each little thread of water has turned into a foaming torrent, with tropical trees covered with flowering creepers growing down to the water's edge. The trees were full of parrots and a handsome game bird called Chachalapa. Had the heat and dust been a little less oppressive, our ride would have been more pleasant; but, besides the continual climbing up and down the zigzagged roads across the Barrancas, we had to ride for miles through sandy Pine Barrens, meeting and passing great trains of mules (we stopped counting when we reached a thousand) laden with products of the country or stores from the coast, and we were truly thankful when we reached the Barranca of Atenquique, at twelve o'clock, and rested for an hour outside a miserable palm-thatched hut. At the top of the Barranca, we were met by an escort of eight mounted police, and an old "mud wagon" with five mules. We were desired to have all arms in readiness, as the road was infested by swarms of robbers, but after five hours' jolting over a perfectly indescribable track, which they called a road, we arrived at Zapotlan in safety, only having broken down once on the journey.

The news which met us here was not encouraging. The day after we had left Colima it had been attacked by the Revolutionists under Don Gulio Garcia; he, having been defeated by the Government troops, was marching upon Zapotlan to join La Bastida, who was in the neighborhood of Sayula, and Don Gulio was expected to be in front of the city by the afternoon of the next day: The telegraph lines were all cut; scouting parties were out round the city the morning after we arrived, and the troops all under arms. As for ourselves the stage could not start till one a. m., the following night, so that we had perforce to try and make the best of a bad business, and pray that Don Gulio might be detained, as indeed it turned out he was, till we were safe on our way.

Zapotlan is a thriving town of 25,000 inhabitants. Its chief manufactures are soap, of which immense quantities are made to supply all the Western States of Mexico, and Pulque, the national beverage made from the sap of the Maguey, or great American Aloe. The streets are much wider and better and the Plazas larger than those of Colima. The latter are planted with oleanders, oranges, and large shade trees, seemingly a kind of ash.

It is needless to harrow your readers' feelings by a minute description of our lodgings in the hotel. Suffice it to say, that our rooms—devoid of windows—opened by heavy wooden doors on the yard full of mules and horses; and that such a thing as a broom or scrubbing-brush was evidently not common in Zapotlan. It was, therefore, with no feeling of regret that at two p. m. on the morning of April 7th, we left the city in a comfortable Concord stage on our way to Guadalajara; our only fellow-passenger being an old lady, who sat in a corner puffing cigarettes all day long.

For the first two hours, our only light was from the stars, but, owing to the unpleasant reports we had heard about the road, we did not attempt to sleep. Every nerve was strained to catch the slightest sight or sound denoting robbers, and just at dawn, as we were going down a steep divide, between cactus hedges, we were startled by seeing a man suddenly drop into a ditch by our side. Nothing, however, occurred, and we reached Sayula, a pretty old town, at about six a. m., and changed our mules. Here we got most discouraging news. The Government troops were marching towards the town; beyond them the Pronunciados (revolutionists) were in force upon the road; while beyond them again the country was swarming with robbers in bands of any number from two to two hundred.

On starting from Sayula we hid all our arms; the pistols we kept upon us, the rifles were put under the seats, we hoping thereby to save them from the Pronunciados if we were unfortunate enough to come upon them.

A little way out of the town we struck the Lago de Sayula, a salt lake with soda-flats all round it. Some few miles along its side we met

the Government troops, a fine body of cavalry, who confirmed the reports that we had heard. Through choking clouds of alkali dust, which scorched the very skin, and jolting over rocks and gulleys, we at last, about eleven, drove into the miserable village of Cebollas (onions) and pulled up in front of a poor-looking house for breakfast, of which we were in need, as a cup of chocolate at starting was all we had tasted since five, the day before.

Severo, our servant, and Galindo, the captain of Don Ramon V.'s private escort, who came with us from Zapotlan, were left to watch the coach, and we were just sitting down to a very uninviting meal, when two Pronunciados rode into the yard and dismounted. In a minute two more and an officer appeared, and then sent in word they wished to search the coach. Expostulations were in vain; resistance out of the question; for, though we could have easily overpowered them, as, with the exception of the captain, they were badly armed, and all drunk, yet they were but the vanguard of a much larger body. We therefore had to submit to what was inevitable, and in a few moments saw the five precious rifles and a couple of pistols handed in through the windows, and stowed in an inner room, by the women of the house. After much "palaver," the pistols were given back to us, and Major Chavarin, the officer, promised to escort us through the worst robber country, which we were fast approaching, till we could get a regular escort. So off we set again with heavy hearts, which were not lightened as, on one pretence or another, the Major and two of his soldiers disappeared before we had driven many miles out of Cebollas, and at last the two remaining men rode up and said they must go too, and demanded our ammunition. That of course was refused and they sneaked off, leaving us comparatively defenceless just at the time of the greatest need.

There was nothing for it but to go on as fast as possible. So most of the gentlemen got outside of the coach, and we turned away from the horrible alkali plains along a road under the hills, with stone walls on either side, straining our eyes at every gap, and expecting to be pounced upon each instant. In one place where we saw

a white rag put up as a signal, the gentlemen got out and went ahead in a skirmish line, making us barricade ourselves with the cushions and valises. The old Senora behaved admirably throughout, and whispered to me from time to time, in a tone of despair, "Ah! los bonitos Rifles,"—"the beautiful rifles."

The road wound along the foot of the hills, with a rich plain below us, fields of sugar cane, maize, wheat, and grass, and quantities of cattle feeding; but we were almost too anxious to take interest in such things, and after two hours more of intense watchfulness, we were thankful to see ahead of us the town of Santa Ana Acatlan.

Here, thanks to the great kindness of Don Ramon V., of Zapotlan, we were furnished with an excellent escort; and in an hour 28 trusty men all well mounted, on tough, spirited little horses, armed with musket or pistol, and machete (a strong short sword,) and under the command of an old army officer, were ready to take us the whole way to Gnadalahara.

We clattered off through the crowded streets (it was market day,) and up the hill towards the Coronilla Mountain, where one of our party had twice seen sets of travelers robbed. At every turn we met ox or mule trains, who had all been robbed that day, and the drivers looked at us as much as to say, "You're in for it." But our good escort kept up with us, gallantly forming front and rear guard in bad places; and dodging along to cut off corners in the safe ones, and so we crossed the neck of the Coronilla in safety. In the valley below we were told to be in readiness, as a robbery had been committed in the morning, and the ground was strewn with papers left from the plunder; and soon we came to a robber-town, Santa Cruz, and saw some men on horse-back sneaking off in the distance evidently thinking us too strong for them. An hour after sunset we stopped in another robber den, Santa Augustin, to change horses, and get a cup of chocolate, our escort halting close around us to prevent a rush on the coach. Then, with six stout ponies, away we galloped, and with a few more alarms we neared the noble capital of Jalisco. It was a wild scene as, at 10 p. m. we dashed through the empty streets, our muchacho

on the box with a flaming torch, and our faithful escort wrapped in their serapes galloping on either side.

But now our troubles were over, and Gen. C. met us at the hotel and took us straight to the

house of a friend which was, with true Mexican hospitality, put at our disposal, in deed as well as word, and, supper finished, we were thankful to go to our comfortable home-like rooms, after twenty-three and a half hours' traveling.

ROSA DEL MONTE.

MINES AND MINING.*

NO. 1.—THE GEOLOGY OF VEINS AND LODES.

As a general rule, ores occur in veins. Veins are clefts or fissures filled with mineral substances, and intersect both crystalline and stratified rocks crosswise. If the mineral substances which the veins contain are metallic ores, then the veins are also called Lodes.

It is believed that such clefts and fissures were caused by the contraction of the earth's crust during its gradual cooling from a heated state. The whole of the earth's crust is so entirely intersected by such fissures that it is very difficult to find a perfectly compact rock large enough even for a cube of ten feet side.

It is not yet certainly known how the clefts and fissures have been filled with mineral substances. The theory is that it was done partly by metallic vapors which, pervading the plutonic rocks, sublimated on the colder parts of the fissures; and partly by steam and hot-water-streams leaching the rocks, and leaving the dissolved substances in the fissures after evaporation.

Supposing these theories to be true, then the plutonic (crystalline) rocks which constitute the earth's crust and were exposed to the formation of fissures in the most extensive manner, will be our best guides to ore-veins. Experience shows that the contact-places between crystalline and stratified rocks are in all countries most favorable to miners, and, among the crystalline rocks, especially Porphyry (consisting mainly of feldspar) Greenstone, some kinds of Trap, Serpentine, and Granite. For instance, the rich gold and silver ores in Hungary and Transylvania occur exclusively in Greenstone; the rich mines

of galena in the Sierra Morena always occur in the contact between Porphyry and the slate-rock; in Italy, while the stratified Apennines are destitute of ores, there are in the Western Toscana, where Serpentine and Porphyry make their appearance, rich mines of Copper pyrites, Gray Copper, and Hematite in blocks weighing 50 tons. The prospectors in our own Park County should look for such contact-places, which must be abundant there, as Porphyry and other crystalline rocks are in contact with sedimentary formations.

In many cases, the crystalline rocks are covered up by stratified rocks; but, even then, there are infallible indications of their presence. Such indications are the so-called metamorphic rocks. The eruption of plutonic masses has produced remarkable changes in the stratified rocks, sometimes up to a height of some thousands of feet, acting upon them by heat and vapors. In this way, compact or slate rocks have been changed into granular-crystalline rocks; limestones, clay, and sandstones have been impregnated with magnesia, silica, or carbon. Talcose slate, Mica Slate, Quartz slate, Quartzite, Gneiss, Dolomite, Marble, Silicious Limestones, and Black Coal-sands and Limestones are the products of the metamorphic process. These kinds of rock are especial bearers of veins with metallic ores. Numberless examples might be given to show how true guides to the miner are such metamorphic rocks.

Although a connection of the veins with the plutonic rocks cannot be denied, the theory in regard to metallic vapors pervading the fissures from below is in many cases insufficient, and in some not tenable at all. The fissures are frequently shut up in the depth; how, then, could the vapors pervade the masses of Granite or Porphyry

* Under this head, we propose to publish a consecutive series of papers on Mines and Mining Processes, most of which will have special reference to Colorado. The Series will include articles from numerous qualified contributors.

of an immense thickness? There are slate rocks which contain great masses of ore without showing any visible change in the materials of the strata. There is a very remarkable relation between the richness of ore-veins and certain kinds of rocks. In all European mining districts, it has been experienced that this or that kind of ore appears more frequently and more richly in the vicinity of a certain kind of rock than in that of another kind, although the same fissure may cross the different kinds of rock. Even among the same kinds of rock, where there is a difference of character, a favorable or unfavorable relation between them and the richness of veins crossing them is perceptible. For instance, the celebrated silver-veins of Königsberg cross beds of Gneiss or Mica-slate, and Hornblende-slate; but only where they cut the latter, are they rich in silver, while they are dead in the vicinity of the former. Such facts cannot be explained on the vapor, or steam, or hot stream theories. Why is the ore not found equally distributed through the vein? Why is it richer in contact with certain kinds of rocks? We can allow that metallic matter may have been brought up to the crust of the earth by such means; but it needs to be explained how it has been gathered from the rocks of the crust into the fissures.

The latest theory is that electricity has been the collecting and gathering power.

The whole globe is known as an immense electric machine, with electric currents from West to East. The volcanic activity of the earth, its chemical actions, its heat and light, its rotation around its own axis and around the sun, the capillary power of fluids in the pores and clefts of rocks—all these are causing electrical currents, penetrating all materials in the earth's crust. Now, it is well known that electric currents effect not only chemical actions and crystalline formations—for instance, the artificial production of diamonds,—but also motions carrying materials from one place to another. As an example, when we connect two vessels, half-filled with water, together by a wet thread, and conduct an electric current through the thread, we see one vessel being emptied and the other filled. In a similar manner, the electric currents in the earth,

no matter how weak, may carry away the metallic parts contained in the moist rocks, and deposit them in other places where the currents meet an interruption or a diminution of integrity. The alternate strata of Limestone, Sand, and Clay in the earth's crust act like galvanic columns, while the clefts and fissures, filled with water and mineral solutions, act like conductors between the single pairs of a battery. Thus, in such fissures, the production of metallic ores must go on; and, as the main currents of electricity in the earth are in a direction from West to East, the most numerous and richest metallic deposits must be originated in those chains of mountains or fissures which strike southwards, and, therefore, cut off the western electric currents. In fact, we find that the rich chains of the Ural, of the Andes, of the Rocky Mountains, and of Australia, show that direction.

Not much has been done yet in the investigation of this galvanoplastic process in our earth, but sufficient has been done to demonstrate its future importance for science and practice. The chemist Cross has succeeded in producing an artificial vein; he mixed a mass of clay with the dust of the oxide of a metal, moistened the mixture, and caused a fissure in it by means of a knife; then he conducted a galvanic current through the two halves; the fissure was filled, by and by, with compounds of the metal. The French chemist Sage has, by means of the chemico-electric powers operating in the growth of plants, proved the occurrence of gold in the soil in the vicinity of Paris, showing its presence in the ashes of vines, which had taken up the gold from their nourishing bottom.

Let us now make an examination in the depths of a mine. We are disappointed, having expected to see a mighty vein of Silver-ore, but seeing only seams of it within the thickness of the vein, and finding it much mixed with gangue, the rock which envelopes the ore. We see the ore intersecting the gangue in a continued band, or, more commonly, partly disseminated through it in some places, and continuing for long distances in others. A good vein often gradually loses its character, the metal disappears, and the gangue alone is left; but, by following on for

some distance, it will frequently resume its former character. The gangue usually guiding the miner in metallic veins is quartz, mostly in fine crystals and as Amethyst, Jasper, or other varieties; also calcspar and heavy spar, carbonate of iron, and, less frequently, fluor-spar.

We often observe a remarkable regularity in the structure of veins; we see the gangue and ore in distinct seams parallel each to the other and to the walls; these seams follow the irregularities of the walls in a remarkable manner, and show in the middle of the vein empty little caves with splendid crystals. Even around fragments of the walls which often occur in veins, we find the seams deposited in the same symmetrical manner. Sometimes we observe only two or three different seams, sometimes thirteen and even more. For instance, we find on each side of the vein, next to the wall, a seam of Zinc-blende with Iron pyrites, then follows on both sides a seam of Quartz, then of Galena, then of ruby Silver-ore, and the middle of the vein consists of calc-spar which always shows its crystals turned toward the middle of the vein.

Following the course of the vein we observe, at first, its out-cropping, supposing the fissure has reached the surface. In consequence of the difference in destruction of rocks and gangue, the vein often appears on the surface in the form of a deepened fosse, or of a steeply projecting wall, as is the case in Caribou and the San Juan district. Downwards, the veins do not keep regular in thickness or richness; they are sometimes crossed by other veins, and in such places there is an influence on the richness of the veins not to be mistaken.

Endeavors have been made to distinguish different categories of vein-formations; for instance, in Saxony, four different groups of veins. But it has never been done with clearness, and, if our ideas in regard to the origin of veins are true, never will be done. The prospector has ever to risk his time, the miner will never have a surety in regard to the value of his mine. And it is good that it is so. If the contrary were the case anarchy would be reigning, and mankind fly asunder.

There are some lodes which are no veins, but

deposits of ores parallel to the strata of any sedimentary formation; in this form, iron-ores frequently occur, also copper slate. In the sedimentary formations of limestone and dolomite, there are often found immense pockets of lead and zinc-ores; for instance, in the Karynthian Alps, in Belgium, in Germany, in Wisconsin, Illinois, and Iowa. It is remarkable that the galena of these pockets is generally much poorer in silver than the galena occurring in veins, while the lead pockets in the limestone of our South Park country (Mt. Bross and Mt. Lincoln), and of Utah, are rich, sometimes even very rich, in silver. In no other country, however, are the limestone formations so much surrounded by crystalline (eruptive) rocks as in Colorado and Utah; and the debris between Mt. Lincoln and Fairplay shows, by its quality and quantity, that in former ages the limestone and the crystalline rocks were in more extensive contact than we can observe at the present time.

Big pockets of ore occur also in crystalline rocks; for instance, the magnetic iron of Clinton County, New York, which is celebrated for its purity.

Gold is not only found in veins, but in loose debris and sand along the declivities of mountains. There it is found in the form of nuggets, grains, or leaves, in company with some very rare metals, and with sand of magnetic iron. It is there the Gulch or Placer mining goes on. We know that these deposits must have been derived from veins, but it is not known by what process; the current of the water alone has not done it, for in places where the debris is most angular and edged there is generally the greatest richness in gold.

In this respect also, we see that our knowledge in regard to the geological occurrence of ores is anything but perfect. If the Creator had made as defined a difference as we do between ordinary rocks and the metallic ores which are useful for mankind and which enrich the pockets of individuals, then we could find more outspoken rules in Geology.

RUDOLPH KECK.

THE MEXICAN BULL-WHACKER.

Of the many sights and scenes in the Southwest that constantly remind the stranger of his proximity to another and entirely different race of people, none is more likely to arrest his attention than that of a Mexican Freighting Team.

The heavily-built wagons, with their enormous loads piled high above the wheels; the thin wiry oxen, with slow swinging gait, dragging them along by means of heavy yokes, which bow down their necks until they are perfect pictures of helplessness and hopelessness; the vociferous and unintelligible ejaculations of the unkempt, ragged, swarthy, and under-sized drivers, as the train moves by, all conspire to make it difficult for the Easterner to realize that he is still within the boundaries of the United States, and not in the very heart of old Mexico.

From five to eight yoke of cattle are generally attached to each wagon, this team being usually driven by a single teamster, who, in the common parlance of the country, is dubbed a "Bull-whacker."

He controls the movements of his lengthy charge by means of a clumsy-looking whip, made up of a very short and very stout handle, and a very long and very heavy lash. When not in use, the handle is generally laid over the shoulder, and the cruel lash drags its slow length along the ground behind. A novice attempting to wield such a whip, succeeds, in most cases, in coiling the lash, like a great serpent, about his neck, and giving himself a stinging blow with its tail across his face; but the professional bull-whacker uses it with the greatest ease and dexterity, and even with an admirable grace. He can switch a fly from one of his oxen so deftly as scarcely to disturb a hair, or he can open a fearful gash in the hide apparently without an effort. To his honor be it said, however, the bull-whacker, despite his name, seldom uses his fearful weapon as an instrument of torture upon his helpless cattle. He makes it bark rather than bite, delighting to swing the huge lash round his head, and crack it with report as loud as those from a rifle; nothing, indeed, more reminds the veteran soldier of a heavy fire along the skirmish

line than the loud and incessant cracking of the bull-whackers' whips, as it is heard, sometimes in the far distance, when one of their trains approaches.

The *personnel* of the average bull-whacker may be picturesque, but is certainly not prepossessing. Garments in which filthiness and raggedness contend for the supremacy adorn his person; the expression of his swarthy face is low and villainous; an unkempt shock of black, wiry hair grows low down on his retreating forehead, and beneath his shaggy brows are two small coal-black eyes ever restless and gleaming.

Yet this degraded bull-whacker, who is a mongrel offspring of the Aztec, the Indian, and the Negro, still boasts of the brave knights who landed with Cortez on the shores of Mexico as his ancestors, and takes unto himself a high-sounding Spanish address that might well have been the pride of any *Cabellero* at the Spanish Court. *Señor* or *Señor don* is invariably prefixed to his address on the letters which he receives; for, strange as it may seem, many of the "greaser" bull-whackers can not only read fluently in Spanish, but write in a very passable hand. Where or how they pick up these accomplishments, Heaven and themselves only know, for in New Mexico, whence they come, the Public School is yet a thing of the future.

And what is that future for the Bull-whacker? His mind seems to be utterly undisturbed by any cravings of ambition, or by any desires for the advancement of himself or his people to a higher place in the ranks of civilization. Like the cattle that he drives, he plods along utterly regardless of what the morrow may bring forth. Wherever night overtakes him, there he unyokes his cattle and turns them loose to graze, and there he makes his "camp." As he squats on the ground, and cooks his uninviting meal, and crouches over the fitful flame of his camp-fire, he presents as abject a picture of human existence as can be imagined. Arriving at his destination after, perhaps, weeks of slow and weary travel, he hastens to those places of resort where he can indulge in the pleasures of dissipation; and, by the

time he has secured another load for his return trip, the resistless charms of *monte*, vile whiskey, and the dark-eyed *señorita* have decoyed the last dollar from his pocket.

Thus, perchance, in the very track in which Coronado and his brave knights dashed along the Mountains to explore and to conquer, does the ragged bull-whacker, claiming them as his ancestors, shamble by the side of his sluggish oxen, ignorant and unambitious, looking upon the civilization of the new world, as it creeps on and on, but looking upon it, only to step backward and backward as it advances.

For many years, the principal business of the bull-whacker was to transport freight from the Mississippi to Santa Fe and other trading points in the South-west; but the discovery of gold and silver in Colorado opened a new field for his operations, of which he eagerly availed himself. Whenever the transportation of freight by wagon was necessary, whether it were to be merchandise to be carried from Omaha or St. Louis to Denver, or lumber to be hauled down from the Mountains, the bull-whacker was ready for a great share of the work. Even the construction of the

Kansas Pacific Railway, which was destined to shorten his line of operations by many hundreds of miles, was hastened forward in no small degree by the bull-whacker and his Mexican cattle.

After the completion of that road, the crack of the bull-whacker's whip was mostly heard along the base of the Mountains on the road leading from Denver to Pueblo and Santa Fe. But even there, he was called upon to assist in the construction of the Denver and Rio Grande Railway, which, in turn, was to wrest from him the profits of a hundred and twenty miles of freighting, and push back the northern terminus of his business to Pueblo instead of Denver.

Thus, like the driver of the Overland Stage, the bull-whacker is forced further and further from the scenes of his former labors, for, in the shrill voice of the locomotive, each hears and bows to the mandate: "Hitherto shalt thou come, and no further." Still the track goes southward, still the bull-whacker recedes, apparently unconscious of the fact that even his own land will soon be invaded. Going, going, but—whither? *Adios, Señor.* JUAN.

OLD INHABITANTS.

Of the many remarkable contributions to Palaeontological science made during the last decade, none are more valuable and interesting than those which have resulted from the devoted labors of Professor Cope. To enumerate his many discoveries would be, in great measure, to rehearse the progress in his branch of science during the period named. His explorations among the cretaceous beds of New Jersey and Kansas have brought to light multitudes of gigantic reptiles more or less resembling the modern alligator, and properly known as *Saurians*. Many of these were of gigantic dimensions, immensely elongated, and the true Sea-serpents of their day. More recently, his investigations among the bone beds of the Tertiary strata have resulted in the discovery of animal forms of a character so remarkable as to place them among the most wonderful yet known. While engaged in the survey of Wyoming as an associate of the U. S. Geological Survey in 1872, he disinterred from the grey

sandstone near Fort Bridger, numerous crania and other remains of a most extraordinary animal of the proboscidian type (that of the elephants) to which he has given the name of *Laxolophodon*. This animal, which no doubt bore a proboscis before him, had also to carry the weight of three pairs of horns, as is proved by the cores yet adhering to his gigantic skull. Two of these horns were attached to the extremity of the muzzle, two were placed upon the frontal bones or thereabouts, and two were apparently an outgrowth from the back part of the head. A full description, both popular and scientific, of this remarkable animal, will be found in the Annual Report of Professor Hayden, of the U. S. Geological Survey for 1872, which has just appeared.

Professor Cope is still engaged in researches among the tertiary "bad lands" of Colorado and adjoining Territories, and the result of his

labors to this date may be found in the following sketch.

The explorations this year, though not yet completed, have been more than usually productive of interesting results. The "bad lands" of Colorado have been discovered to be the graveyard of a long past period, distinct from that of Wyoming, and to contain the osseous remains of a great population of beasts, of totally different species and even orders from those of the latter age and region. They resemble more nearly those of the White River of Nebraska, but many have been obtained by Professor Cope, not known there or elsewhere. So far, he has proven the existence of seventy-five species, some represented by thousands of individuals. Of these, at least forty species are new to science. They range from the size of the mole to nearly that of the elephant; six species only are reptiles.

Several forms of Insectivorous animals, related to the mole, and of very small size, have been procured. The delicacy and minuteness of these fossils is surprising.

Gnawing animals, or Rodents, left numerous remains, of fourteen species, some not larger than the domestic mouse. Some were the predecessors of the rabbits, others of the squirrels, and others of mice.

Of cloven-footed quadrupeds, a great many species have been found. Some were nearly intermediate between the deer and the hog in structure; like the latter they had no horns; they were about as large as sheep. Others were about the size of grey squirrels, being the smallest of this class of animals ever discovered.

Several species of horses were living during the same period, as is proven by the bones and teeth which have been obtained.

Their relatives the *Rhinoceros* abounded in Colorado in former days, no less than seven species having been procured by Professor Cope. One of the specimens is a perfect skull, with teeth complete and covered with the moss-like crystallization seen in the moss-agate.

But the most remarkable monsters of the past, whose existence has been disclosed by the present survey, are a series of horned species related to

the *Rhinoceros*, but possessing some features in which, according to Professor Cope, they resembled the Elephants. They stood high on the legs, and had short feet, but possessed horns in pairs on different parts of the head. One of the largest species had a huge horn over each eye, while another had one on each side of the nose, of more than a foot in length, resembling those on the back part of the head of the ox, etc. A third one, of larger size than the last, had rudimentary horns on the nose. The first-mentioned species has been named by Professor Cope *Mio-basileus ophryas*, and the others have been placed in the genus *Megaceratops*, as new species. Their structure disproves entirely the statement of a recent writer that the presence of horns in pairs is an indication of relationship to the ruminating animals (oxen, etc.) for these beasts are quite near the *Rhinoceros*.

Carnivorous species were not rare in this ancient family, and served, as now, to check the too rapid increase. There were wild cats, dogs, *Hyaenodons*, and the *Tomarctos*, a new genus found by Professor Cope. It resembled a bear, and was as large as the black bear, but was much more carnivorous in its propensities. *Hyaenodons* were as large, and had many flesh teeth; while some of the cats had remarkably long canine, or eye-teeth. In a new species, the size of the panthers, these teeth greatly resembled those of a shark.

The forthcoming reports of Professor Hayden to the Secretary of the Interior, will contain a full account of the discoveries in this interesting department of geological science, made during the progress of the Survey from 1870 to the present time. Professor Cope has obtained from the ancient sea and lake deposits of Kansas, Colorado, Wyoming, Idaho, etc., about three hundred species of vertebrated animals, of which he has made known to science for the first time nearly two hundred. The history of the succession of life on this Continent, as well as that of other regions of the earth, will be much elucidated by the proper investigations of the specimens preserved by the survey. The subject has a special interest with reference to the history of the origin of the human species.

IRRIGATION AT SALT LAKE.

When the vanguard of the Mormon people passed through Emigration Cañon on the 24th of July, 1847, and looked down upon the valley of the Great Salt Lake—their future home—they beheld an almost utter barrenness, which might well have struck dismay and despair into the stoutest-hearted among them. Immediately before them the ground was hard almost as brick, and bearing nothing but sage-brush and crickets (the latter so plentiful that the Indians fed upon them), and beyond was a wide waste of swamp and alkali land, with nothing of verdure to relieve the desolateness save the green borders of the Jordan River.

That valley, however, was the goal for which they had been aiming, the Promised Land which, according to their prophet, had been appointed unto them; and, three days after their arrival, they set to work to transform the wilderness into a fruitful field. When they tried to plough a little patch, they broke plow after plow in succession in the hard, stony ground; then they turned water upon it, and it became a slough in which their oxen were mired; but they went on laboring and learning—perchance, praying—until today they have a city of 25,000 people, almost every house in which is embowered in a grove of fruit trees, whose branches bow beneath their burdens, and—south of their city—a wide stretch of fields and orchards, whose rich fertility rivals that of any section on the face of the earth.

From the work that has thus been done in Salt Lake City and its immediate neighborhood, Colorado ought to be able to learn some valuable lessons, for, in physical characteristics, there is considerable correspondence between much of that part of Colorado which lies along the base of the mountains and that part of Utah immediately under consideration.

Salt Lake City lies directly at the foot of the Wahsatch Range, which runs from North to South, and a small spur from which juts out immediately to the north of the city. The site on which the city stands has, in consequence, a slope from the North and the East. The more

elevated portions of the slopes—known as the "Bench Lands"—have a gravelly soil similar in apparent character to that which prevails so largely in Colorado; the lower lands to the south of the city have partly an "adobe" character and also embrace a considerable proportion of reclaimed alkali land, this reclaimed land being now, for the most part, a rich black loam. In character of soil, therefore, we see a marked correspondence with the soil which Colorado offers to the agriculturist. The altitude of Salt Lake City is 4,300 feet. The mean annual rainfall during the past 23 years has been 20 inches; east of 113° W.,—that is in the mountain country east of the city,—it has been 25 inches. The mean temperature during the same period has been: Spring, 51.73; Summer, 75.02; Winter, 32.08; for the year, 53.24. The rainfall at Colorado Springs for the year ending November 30th, 1872, was 28.30 inches. The mean temperature at the same place for the same period was: Winter, 29.84; Spring, 46.78; Summer, 67.29; Autumn, 45.85; for the year, 47.44. The season between frosts at Salt Lake is of about the same length as that in the valley portions of Colorado, and the Winter has similar alternations of severe cold "snaps" (the thermometer, however, not falling so far below zero as in Colorado) and bright sunshiny weather.

It is, of course, impossible, to draw exact parallels; all large areas of country have diversities of character, and especially is that the case in mountainous countries, where there is endless variety in altitude, and consequently in soil, temperature, rainfall, etc., so that what is true of one district cannot be taken as accurate description of another district only a few miles distant. The comparison, however, which we have given shows that there is a general similarity in elevation above sea level, in character of soil, in average rainfall, and in temperature, between the neighborhood of Salt Lake City and many portions of Colorado, sufficient to make the experience gained in the former available, to a large extent, for the latter.

The first noteworthy point is the demonstra-

tion of the fact that the soil lying immediately along the base of the mountains, unpromising as it looks before it is cultivated, is, in reality, as fertile as any that can be found. Those who have been in Colorado for any length of time are fully convinced of that fact; but new-comers are slow to believe it—slow to believe that the dry, red-brown soil, which bears such scant vegetation when left to itself, can be made to yield crops which will put to shame the productions of the soil "back East" where it is "as black as your hat." Salt Lake City and other portions of Utah, however, demonstrate on a large scale what Colorado farmers have also proven on a smaller scale—that this *debris* of the mountains is exceedingly rich in all the elements essential to plant-growth, and produces with a marvelous abundance when properly cultivated. On such soil, the Mormons raise as high as 90 bushels of wheat to the acre; 50 or 60 bushels is a common yield, and the average is probably somewhere about 30. All kinds of grain and grass are grown, and almost all kinds of fruit* and vegetables, the products of all being exceedingly abundant in quantity and first-rate in quality.

The reclamation of the alkali lands which has been practised by the Mormons with so much success is especially of interest and importance to Colorado. Land near to Salt Lake City, from which in former times the alkali could be shovelled with readiness is now worth \$200 or more per acre, being among the most productive which the Mormons possess. Alkali lands, in fact, are *too* rich, or fat with the very best fertilizers, and all that is needed to make them of great value is to bring them down to a leanness which will make them available for cultivation. The method generally adopted in Utah has been to *leach* the land, levelling it so that water would stand upon it. The mineral matters are thus dissolved and held in solution by the water, and, by throwing off and renewing it from time to time, sufficient of the alkali is removed to leave the land fit for cultivation. Water which will leave a deposit of sand or mud is preferable, and fresh fine sand has been found excellent to spread on and mix with

the soil, as it both warms and weakens the saline lands. Repeated ploughing is also of service, as the soil comes in contact with the gases of the atmosphere, and has been found to lose strength in consequence. In putting in crops, it is recommended to plow immediately before sowing on mineral lands, as the mineral rises to the surface, and plowing turns it under again, and gives the grain or vegetables a chance to grow some size before the mineral forms a crust. A good coating of chaff or partially rotted straw put over the surface the first year will keep the ground moist and prevent crusting. Plentiful irrigation is also valuable for the same purpose. It has been found that castor beans, summer squash, melons, onions, and lucerne (or alfalfa) will grow where there is a considerable portion of mineral; and some Mormon farmers recommend that they should be planted on newly leached lands: castor beans first, and so on in the order named. Fruit trees can be grown well on such lands, by putting sweet fresh soil around the roots and especially around the stock where it comes out of the ground, for if the tree be injured in any way by salt it will be the bark at the surface of the ground. Pear trees will stand almost any amount of salt and grow well. When fruit trees get once rooted in salt land, they become healthy and yield the best quality of fruit. Amongst grasses, red-top has been found to stand alkali well.

In Colorado, we are too ready to regard alkali land as almost, if not absolutely, worthless. We may profitably avail ourselves of the experience of the Mormons in this matter, that experience having shown, as we have said, that such land, when reclaimed, is of the very best quality. The process of reclamation is somewhat tedious, occupying, in some cases, as long as four or five years, but not too tedious to pay, when worthless land can be made to produce two and a half to three tons of hay, or seventy-five to eighty bushels of grain, to the acre.

Next to the soil—for the soil would be of little or no value without it—the Mormons regard their Water as their most precious possession. It is recognized as an important subject for legislation, and its apportionment among the people is regulated with the utmost watchfulness and exactness.

* We propose to devote a separate article in a subsequent number of OUT WEST to the subject of Fruit Culture by the Mormons.

The Territorial Laws delegate to the Counties the right to control the Irrigating Waters within their limits, and, as a first step, each County is laid off into Water Districts, and Watermasters and Sub-Watermasters appointed to take charge of the water in such districts, acting under the instructions of the County Commissioners. Any one wanting land for cultivation has to apply to the County Surveyor to have the land surveyed. The survey is then submitted to the Commissioners, who consider whether there is a sufficient surplus of water,—after the lands already taken up have had all that they need—to irrigate the land in question. If they decide that there will not, the applicant is unable to obtain any water-rights; if they decide that there is, then the Commissioners approve the survey, and the applicant becomes entitled to his share of water. When there is abundance of water, every man takes it as he needs it, or as he thinks he needs it; but in times when there is a scarcity, the Watermasters apportion it in exact proportion to each man's quantity of land. Thus, if there be five hundred acres under a particular ditch, and crops need watering every ten days, a man who has fifty acres will have the water for twenty-four hours, the man who has twenty-five acres will have it for twelve hours, and so forth; the general plan being to give each man the whole of the water for a period of time corresponding exactly with the area of land he has to water. The Watermasters open and close the gates, which cut off or turn on the supply, and any one tampering with the gates is regarded as a criminal of the highest order. The Watermasters are County Officers, but are paid for their services by the farmers deriving water from the ditches, and they are empowered to demand labor (or its equivalent) from the farmers whenever work is needed upon the ditches. The assessment, which is a *pro rata* one, founded on the quantity of land each farmer has, is usually very small, the Mormons having the faculty of doing most of their work very economically. As a general thing the Irrigating Canals are built by combinations of landholders whose lands will be benefitted, but the Counties sometimes undertake their construction as works of public utility, and the Territorial Legislature has made similar

investments. Salt Lake County, for instance, is now letting contracts for a canal of about 25 miles in length, to run from Utah Lake to the Great Salt Lake. This will cover about six townships, and is estimated to cost about \$50,000. The County has appropriated \$30,000 for the purpose, and the remainder will probably be made up by the sale of water-rights. The *perpetual* water-right from such a canal will be sold for about \$2.50 per acre, the County not seeking to make any direct profit from the enterprise.

It seems to us that in this particular, perhaps more than any other—namely, in the control and regulation of the available Water Supply—Colorado needs to learn of Utah. With us as with them, water is one of the most valuable elements of wealth, (not excepting even the gold and silver), with which Nature has endowed the country, and the utmost economy in its use should be enforced, so that what we have may be made to go as far as possible.

We have, probably, sufficient legislation on the subject, if it were acted up to; but the law is, to a great extent, allowed to remain a dead letter. As the legislative enactments on the subject of Irrigation may not be very generally known, especially among the more recent settlers of Colorado, it may be well to present here the principal of them.

Section 1 of Chapter XLV. of the Revised Statutes of Colorado, provides that all persons who claim, own, or hold a possessory right or title to any land or parcel of land within the boundary of Colorado Territory, when those claims are on the bank, margin, or neighborhood of any stream of water, creek, or river, shall be entitled to the use of the water of the said stream, creek, or river, for the purposes of irrigation, and making said claims available to the full extent of the capacity of the soil, for agricultural purposes.

Section 4 of the same chapter provides that, in case the volume of water in said stream or river shall not be sufficient to supply the continual wants of the entire country through which it passes, then the Probate Judge of the County shall appoint three Commissioners, whose duty it shall be to apportion, in a just and equitable

proportion, a certain amount of said water upon certain or alternate weekly days, to different localities, as they may in their judgment think best for the interest of all parties concerned, and with due regard for the legal rights of all.

Section 9 provides that such Commissioners shall not be appointed until at least six days' previous notice shall have been given to parties in interest, by posting notices of the time and place when and where such appointment will be made, in at least five public places within the region watered by the said stream.

Chapter XLV was subsequently amended for Pueblo County, so as to authorize the appointment of one Commissioner, instead of three, such Commissioner to be a person recommended by the riparian owners along the stream, and only to be appointed on the petition of a majority of such riparian owners.

A local Act for Costilla and Conejos Counties, afterwards extended to Huerfano and Las Animas Counties, provides for the yearly election of a Superintendent for each *acequia madre* (main ditch), to be chosen by the persons occupying the adjoining farming lands. The duties of such superintendents are defined to be to keep the ditches in repair, and to divide the water in such a manner that each and every one will have the amount of water he is entitled to. The superintendents are empowered to call out the persons using water from the *acequia* to contribute their share of work when repairs are necessary. The superintendents to receive such compensation as may be agreed on by the majority of those using the water. This Local Act provides that public *acequias*, during the farming season, shall have preference over all ditches used for any mills or machinery, or any other ditch that may not be used exclusively for farming purposes.

A special act for El Paso County provides that the Commissioners shall be paid \$5.00 each for each day actually employed in the discharge of their duties, and authorizes them to levy a tax within the County upon each person using water for irrigation, in proportion to the amount of water used by each person. The said Commissioners, with a due regard for prior vested rights, shall, from time to time, establish such rules and regulations as in their judgment are necessary

and proper for securing the purposes of the act, and are required to keep in a book devoted to that purpose a correct account of the amount of land each person is authorized to irrigate, and a record of all their rules and regulations for the proper distribution of water. In case of gross neglect of their duties, to the injury of others, they are made liable to the party or parties aggrieved, in double the amount of damages sustained. Anyone using water to which he is not entitled during such time as the Commissioners are controlling it, is made liable to a fine of \$100 for the first offence and of \$300 for each subsequent offence, or to imprisonment for 30 days.

The law as it stands is doubtless capable of improvement, and might well have attention at the coming Session of the Territorial Legislature, so that an Act sufficiently comprehensive to suit all parts of the Territory and yet sufficiently elastic to allow each County to provide for any peculiar circumstances of its own, could be framed.

The provisions of Chapter XLV., however, seem fully sufficient to allow of the appointment of Irrigation Commissioners in every County in which there is agricultural land, and such appointments should be made. As matters are now, we have little knowledge as to the extent of our available Water Supply, and no guarantee that it is used with economy. If we had Commissioners, or one Commissioner, in each Agricultural County, whose special duty it should be to control the Irrigating Waters, a large amount of useful knowledge ought to be gathered together, and a very considerable increase of the area of land now regarded as cultivable ought to be the result. Some of the best farming land in Colorado is, to our knowledge, allowed to lie uncultivated from a fear of want of water, whereas a careful and equitable division of what flows through the country would give sufficient to cover it all.

Touching the much disputed question whether the cultivation of the soil has a tendency to increase the rainfall in a naturally arid country, the experience of the people at Salt Lake seems strongly corroborative of the theory that it does. Some soil which formerly required irrigating several times in the year, now needs no irrigation at all, and other soil needs it

much less than formerly. This, of course, might be expected, even without any increase of rainfall, but old settlers in Utah say that the increase of rainfall is quite noticeable, and the comparative frequency of rain in the Summer time much greater in later than in former years. The presence of the Union Pacific and other railroads has been suggested as the existing cause of this phenomenon. The *Deseret News*, however, says that, without denying that the railroad has exercised an influence in the matter, the effects were observed in Utah before the advent of the railroad. The opinion of the *News* is that "the increased moisture of the Summers of late years is due, firstly, to the hand of Providence, and secondly, to the cultivation of the lands, the building of cities and towns, the planting of trees, shrubs and vegetables. For it is reasonable to suppose that a stirred and irrigated soil, and thousands of acres of trees and shrubs and various kinds of cultivated vegetable crops should give into the atmosphere much more moisture than a hard, dry barren soil." It may be stated here, in order to meet an objection sometimes urged, that the increase of rainfall can scarcely be a *fancied* one; when the Mormons began to build Salt Lake City, they estimated that the creeks running into the district which they had chosen

would water eight hundred acres of land; at the present time their city limits include an area of not less than twenty-five square miles, every part of which is well watered.

We see, then, that cultivation has a two-fold effect: it increases the supply of water for irrigating purposes and at the same time it renders irrigation less needful in after years than at first. It is evident from this that the true policy, when aiming at the irrigation of considerable bodies of land, is to use, to the fullest extent of its availability, the water which is readily obtainable, and expend money in increasing the supply only when experience demonstrates that Nature herself fails to be bountiful. If it can be seen, for example, that there is water enough in a certain district to irrigate 50,000 acres, if used with the utmost economy, let the utmost economy be practised, and it may be that before another 50,000 acres is needed for cultivation, a sufficient increase of the water supply will have been brought about naturally.

There are other points connected with our subject of which we had intended to treat, but our article is already lengthy enough, and a future opportunity may be taken to derive one or two more lessons from the Mormons.

ON MOUNT LINCOLN.

One of the members of the Hayden expedition, writing to the *New York Tribune*, gives the following description of the view from the summit of Mount Lincoln:

It was a highly favorable time for the view. Not a suspicion of mistiness in all the wide horizon, and the early sunlight brought out sharply the gradations of distance in the West, which a few hours later were comparatively obscured. The sun shone warm, but there blew a fierce, cutting wind, which made us glad, when we could, to crouch in all our wraps behind the pyramid of stones piled about the flag-staff. But the sublimity of the scene long overwhelmed and drowned all other impressions. Such a grand panorama of mountains is to be seen in few other regions of the world—perhaps only in the Himalayas and the Andes. We reckoned with careful

count, and estimated that we had in view more than one hundred peaks which would not fall below 13,000 feet, and at least fifty of 14,000. The two great connected ranges which were most conspicuous were the Sierra Madre to the West, beyond the Arkansas Valley, and the Blue River Range to the North, a continuation of that upon which we were, but bending around westward enough to bring a great line of rugged peaks against the sky. In the Sierra Madre lie two prominent summits, named Yale and Harvard by Prof. J. D. Whitney, in his explorations here four years ago; and the ridge finishes abruptly at the north, with the highest peak of all, estimated by us at 15,000 feet, and named the Holy Cross, from the two immense snow-banks intersecting each other conspicuously on its side, as seen from Gray and Evans, further north than this. The

Spaniards had a Santa Cruz Mountain, doubtless named from the same peculiarity, somewhere in this part of the Rocky Mountains; but, in the absence of maps and of distinct descriptions, it is matter of great question precisely where it was. Rumors of surpassing heights attach themselves to the name of the Holy Cross, and of Sopris Peak; the explorations of this Summer will go far toward settling what is, after all, the highest summit in Colorado, and in the whole United State. As viewed from Gray, Evans, and Lincoln, the palm belongs to two great mountains far beyond the Sierra Madre, and near to one another; one a ride with a hump upon it, and the whole covered with unbroken snow, like an Alp; the other a mass ending in a perfectly conical black peak. By leveling and estimate of distance, we believe those summits to rise above 16,000 feet. We are making off in that direction.

But to return to Mount Lincoln. Almost below it lies the Hoosier Pass, a low ridge across the valley up which we had come, perhaps of moraine origin, separating the affluents of the two great oceans, the Platte leading to the Gulf of Mexico, the Blue to the Gulf of California. Indeed, on the next mountain are head branches of the Platte, the Blue, and the Arkansas, and it has been thence very suitably named *Treaique*. We see the Platte tumbling down the precipice just opposite, out of an always frozen lake. On this side the famous mountains Gray and Evans are hardly conspicuous among a host of their equals; Long's is almost hidden by the narrow ridge. South-eastward, the Park makes a marked and welcome variety in the scene, and beyond it the great isolated mountain of Pike's Peak is very distinct and striking. On the whole, this mountain summit commands points in a region of country nearly or quite 25,000 square miles in extent. No such view is to be obtained in Switzerland, either for reach or for magnificence of the included heights. Yet, of course, one misses the beauty of the pure Alpine mountains, with glaciers streaming down their sides. Here the snow lies abundantly in lines, and banks, and masses, but it absolutely covers nothing. No description can give any idea of such a scene, no drawing or photograph even; although very successful panoramic views have been obtained by the artists of

the Survey, both with the pencil and with camera. Dr. Hayden's expeditions have always been noted for their attention to this part of the work.

I cannot leave Mount Lincoln without a word respecting the lovely Alpine flowers which are found growing in profusion on its heights as well as on all the mountains here, covering with beauty and fragrance the grassy slopes on the rocky declivities, from the timber line to the very summit. A *Polemonium*, with rich bunches of sweet-smelling blue bells, I picked within five feet of the flag-staff at the top of Lincoln, and it is abundant everywhere. Conspicuous among the others are a *Claytonia*, or Spring Beauty, an exquisite deep blue *Myosotis*, or forget-me-not, species of *Phlox* of various colors, etc., etc. Nothing on the plains can vie for rich and delicate beauty with these children of the mountain tops, chilled every night to freezing, and drawing their nourishment from the just melted snow.

COLORADO FOR CONSUMPTIVES.—An eastern newspaper, commenting upon the statements of a correspondent, who is doubtless a chance observer in the Rocky Mountains, concludes that, despite the "glowing descriptions" to the contrary, the climate of Colorado is not so beneficial in lung diseases as other places, for the climate of which no special benefits have ever been claimed. The paper in question bases its conclusion upon the fact, by no means remarkable, that Colorado, and especially "the portions that have been most highly praised," furnish a great many deaths annually from consumption. The deaths from this intractable malady in the Territory for the year 1873 numbered less than twenty. Yet we had in the Territory last year, and still have, we presume, an invalid population of at least a thousand. Many—probably a majority—of these invalids would not now be alive at all had they remained in their eastern homes, where the extremes of heat and cold are very great, and where the humidity of the atmosphere has a most depressing and most pernicious tendency upon those afflicted with pulmonary complaints. It is idle, however to expect that the lives of all the invalids who resort to Colorado can be saved. Very many—probably a majority—do not come until their cases are beyond the hope of permanent relief. All that this climate can do for such invalids is to lengthen their existence by a few months or years. It is well-known, too, that of all diseases that afflict humanity, there is none in which the sufferer is so buoyed up with hope as in this distressing malady, consumption. Hence, we find here, among the multitude who have come with a hope of cure, very many with whom a cure has for months and years been an impossibility, though they seem to have little idea that death is upon them. But leaving aside the "glowing descriptions" to which the journal in question alludes, and coming down to indisputable facts, there is the most overwhelming evidence from actual statistics, not less than from the experience of hundreds and thousands of invalids, that the climate of Colorado is not surpassed, if, indeed, it is anywhere equaled, as a place of resort for consumptives, or persons generally of delicate constitutions.

MISCELLANEOUS SELECTIONS.

THE GREAT CANYON OF THE ARKANSAS.—Imagine yourself standing upon a point of rock, surrounded by the pinon and cedar timber of the country,—a number of eagles circling, screeching and screaming about you, sometimes high in the air and at others away below you, looking down, down, a depth which makes you dizzy, along a rocky wall not smooth and even, but indescribably rough and jagged, studded here and there with pinon and cedar trees which find rootbold in the crevices of the rock, to a stream of water, seeming at the great depth like a silver ribbon. Raising your eyes from the scene below and looking about you, you see on every hand an apparently boundless expanse of mountains and valleys, with little parks nestled here and there in the timber-clad hills, presenting a view in marked contrast to that upon which you have just gazed. Looking down the river, far as the eye can reach, you see the rolling plains seeming like a boundless expanse. Such wild and picturesque scenery you never conceived, much less looked upon. You gaze until satisfied and move to another point, perhaps after losing some great rock and sending it thundering and crashing down to the water below, causing the echoes to wake far and near through the great chasm, and an entirely different scene is opened to your view. True, it is of the same character as that upon which you have already looked, but looking from your present stand-point you see many things which were not apparent before. Thus, climbing from rock to rock, the scene presents new forms and you never cease to wonder at the beauty and grand sublimity of the picture spread out before you. You look again and again, and turn regretfully away when the lengthening shadows warn you that it is time for you to retrace your steps. Many people who visit our town fail to look upon this scene, which is compared by one who is familiar with the great waterfall as equal in magnificence and splendor to the Niagara itself.—*Canon City Times.*

GOING TO THE SHOW.—The greatest event of the century for the inhabitants of this part of Colorado is John Robinson's show, that exhibited Monday. Nothing like it has been known before. It has brought to our town crowds of Mexicans who were born here, and who, of course, never witnessed anything of the kind. The old settlers, the frontiersmen of other days, also put in an appearance, at this the latest illustration, proving that the days of trapping and trading are gone, and that the accessories of civilization are certainly coming this way. Dick Wooten was here from his home in the Raton mountains, one hundred and eighteen miles away; Charlie Autohees, Zan Hicklin, and other well known pioneers, have put in an appearance from their homes on the Huernano, the Greenhorn, the Apishapa, the Las Animas, and other streams. There were citizens from Santa Fe and other points in New Mexico who had judiciously timed a visit to our metropolis; there were mountain men and sheep men, cattle men and ranchmen from their homes up and down the river. Nor has the enthusiasm and excitement manifested by these people been much less than that of our own citizens who have been deprived of the privilege of beholding a circus and menagerie for terms of two, three, four, five, six, and a dozen years. Called together at the name of John Robinson, all these and many others have gazed and wondered and laughed while the "elephant now goes round," and the clown has told his well-worn jokes, and the acrobats and gymnasts have performed their feats of daring. Take it all in all, no more appreciative audience has looked upon the wonders of the Great Moral Circus and World's Exposition than the majority of those who crowded John Robinson's show.—*Pueblo People.*

A CHANCE DISCOVERY.—In 1858, Mr. A. J. Williams—one now one of the leading citizens of Denver—started from Des Moines, Iowa, with three wagons, each drawn by three yoke of cattle, and loaded with Indian and settlers' goods. His destination was the base of Pike's Peak where gold had just been discovered. Williams located first at Fort Lupton, thirty miles east of Denver, but bearing that a settlement was being made at the mouth of Cherry Creek, he moved his teams and goods to that point, where he joined the Russell brothers and General Larimer in laying out a town, and erected the first store in Auraria, now West Denver. Williams, with General Larimer and a few others, soon afterwards crossed Cherry Creek and surveyed and laid out a new town, which they named after the then Governor of Kansas, General Denver. Having entered into mercantile pursuits, Mr. Williams found himself at a loss what to do with his eighteen head of cattle. He had no hay, and grain was out of the question, none being nearer than the station, 600 miles distant. They were too poor for beef, while game of all kinds could be had for the shooting. Williams finally resolved to abandon his cattle to their fate. He accordingly drove them out upon an island in the centre of the Platte, near Fort Lupton, and left them to live or die upon the dry grass which then covered the Platte Valley. Early in the spring Mr. Williams had occasion to visit old Fort Lupton, and curiosity led him to go in search of his cattle to see what had become of them during the long, cold winter months. What was his surprise on landing on the island, to find his cattle, not as he expected, all dead or mere shadows, but as fat and sleek as if fed upon grain all winter. He wondered much at this discovery, and at once caught up his teams and drove them to Denver, where he used them every day during the spring and summer hauling lumber from his mill in the mountains. This was the first discovery made of the fattening properties of the dried grass of Colorado, which covers the plains and hills nine months out of twelve. Although the credit of wintering native cattle in the valleys of Colorado is claimed by and properly belongs to Colonel A. J. Williams, of Denver, Texas cattle had been driven as far north as the Arkansas River and wintered as early as 1847, when Colonel St. Vrain and Colonel William Bent drove several thousand head from New Mexico and wintered them near Bent's fort. Since that, Maxwell and others drove cattle as far northward and established stock ranches on the streams leading out of the Sierra Mojada range, and at the foot of the Hauptollas and upper Las Animas. But it was not until 1866 that a herd of Texas or Mexican cattle was driven north over the "divide" between the Arkansas and South Platte Rivers. During that season, Colonel Williams—who had had never lost sight of the advantage offered by Colorado for cattle raising, drove 1,500 head of Mexican cattle over the "divide." He met with fierce and hostile opposition from the settlers in the valleys south of Denver, but when Williams offered them good cows and calves for one-third the price that they had been used to pay for them, the settlers soon ceased their opposition and themselves became purchasers of Williams' cattle. Since that time a constant stream of Mexican cattle has been pouring into Colorado, so that at this time the number of cattle in Colorado is estimated at from 150,000 to 200,000 head, and at least half of these are natives, or half-breed cattle.—*Correspondence of Inter-Ocean.*

THE CAPTAIN OF THE COW-BOYS.

I'm Captain Jack of Kurber Creek.
I wear good clothes and keep 'em sleek,
On what I buy I ask no "tick",
For I'm captain among the cowboys.
I do that work which I think to be, think to be, think to be,
Consistent with the dignity
Of a captain among the cow-boys.

Twice a year I corral my cattle,
And if one turns to give me battle,
The way I make the fence poles rattle,
Would draw a smile from a preacher.
And when I try to rope a calf, rope a calf, rope a calf,
My perseverance would make you laugh,
But I mostly catch the creature.

If a visit to Blackjack ranch you pay,
By way of advice just let me say,
You'd better not come on branding day
If beauty is your portion;
For what with dust and what with blows, what with blows,
what with blows,
A dirty face and a broken nose,
Will likely change your notion.

Pueblo Chieftain.

COLORADO FLOUR.—The crops of Colorado are getting noted for quality as well as size. The wheat is shipped into St. Louis and Chicago, and converted into fancy flour; and the home mills throughout the Territory, about twenty in number, have nearly all of them filled orders for export. The Littleton mills, near Denver, last spring shipped twenty car-loads of flour to Boston and Buffalo. In all the markets of the Territory, Colorado flour is quoted regularly from fifty cents to \$1 7/8 100 lbs above the best brands in Illinois or Kansas. The wheat crop of last year is estimated at 950,000 bushels, but one-half of this was exported, leaving a short supply for home consumption, which was made up by the importation of Utah wheat and considerable quantities from the Rio Grande country, in New Mexico.—*Buffalo (N. Y.) Commercial.*

THE SIZE OF COLORADO.—Few people have an idea of the size of Colorado. Should you say that Colorado embraces 105,708 square miles, few would gain an idea as to what it means. It would be to many a row of figures meaning something, but what, they hardly know. Even in the Territory there are not many who know what a vast domain is designated by the name of Colorado. That this is true to a great degree in regard to Eastern people is shown by the fact that many believe that Denver is nearly all there is of the Territory. What would be thought of a person who would consider London as being all of England? Yet Colorado is more than twice as large as England, larger by far than England, Scotland and Wales together. You could cut three Irelands out of Colorado and still have enough ground left to build up Wales. Switzerland could be hid in the mountains, being less than one-sixth as large as our Territory. Take out of Colorado as much land as would make six Eastern States and you have a country left as large as Kentucky, with a patch as large as Delaware for a vegetable garden, and a common ten times the size of the District of Columbia. New York, Pennsylvania, Maryland and Rhode Island fall short by over two hundred square miles. Iowa and Kansas miss it by over five hundred square miles. Ohio could be built out of Colorado twice and then there would be a remainder larger than Connecticut and West Virginia. Rhode Island is one eightieth as large as our Territory. Chip off a chunk equal to the New England States, slice off a piece the size of New Jersey, break off a peak equal to Delaware, dump out of the San Juan District a clump of gold as large as Maryland, and there will remain a tract of land larger than Switzerland.—*Rocky Mountain Leader.*

TREES AND RAINFALL.—The effect of trees on the rainfall of a country is no longer a question. A peach tree gives off 18 pounds, or about 2 gallons, of moisture every 12 hours. The evaporation from the earth through trees is immense; the roots often draw from springs themselves, and throw off through their branches great volumes of humid air. Especially is this true in Nebraska, where, at the depth of twenty feet, white sand is struck, and this sand is so full of water that, in many places, subterranean streams have been formed, which have been frequently found when boring shafts or wells. The great currents of air which leave the Pacific coast humid and warm empty in snows on the Rocky Mountains, and, leaving the mountains dry, they sweep over the vast plains, finding no moisture to take up until they pass over the Missouri and Mississippi, when, having become again charged, they empty in Illinois and Wisconsin. In Wyoming Territory, the death is almost complete; but in Nebraska the heavily-timbered heads of her streams give some humidity, and the clouds empty in frequent showers along the Loups, Niobrara, Platte, Elkhorn, and Missouri. Those who have watched the effect of forests on rainfall say that, by commencing at the edge of the dry belt, the forests, and consequent rainfalls, may gradually be extended across the whole of the dry belt. So we might commence, say, 200 miles west of Omaha, and, by gradually planting trees westward, increase the humidity of the atmosphere, until the required moisture for rain is reached all over the plains. In Germany the Elbe lost 18 per cent. of its flow in consequence of cutting away the trees along its banks, exposing the water to the hot sun and consequent increased evaporation. The island of Santa Cruz, in the West Indies, which, twenty years ago, was a garden of fertility, is now a desert—the result of cutting away the forests. The theory is this: The dry currents of air are retarded by the forests, and elevated until a point of condensation is reached. Radiation is also prevented, the air cooled, and the clouds passing over the forests are rendered more easily condensed. Electricity is also a great agent, the trees being negatively charged, and drawing with great power the positively-charged clouds. I advance these theories with no hesitating doubts, for they are no longer experiments, but facts—demonstrated by positive experience and knowledge of the laws that govern the atmosphere. Our learned senator Hitchcock, of Nebraska, agrees with me in these views; and it was a conviction that they were correct which led him to frame and have passed this great timber bill, allowing one hundred and sixty acres of the public land to every person who would plant forty acres of trees, and keep them in good order for ten years. The state law of Nebraska also exempts all lands from state taxes for five years when the farmer or owner will plant a few acres of timber on them. It has been shown that tree-planting, as has long been supposed, is neither difficult nor expensive; that the returns, if not immediate, are sure, and the profits very great. From all that has been said, I think every one ought to be convinced that the time has come for us to plant forests; but whether the people are willing to plant them or not, they should be made to do it. All overseers of roads should be made at once to plant trees along the highways at the public expense. Railways also should be compelled by law, not only to fence, but plant trees along the whole of their lines, on either side of the track, and those *vandal fathers* who have robbed their children of the best part of their heritage—the forests of the country—ought to be compelled by law to restore it as fast as possible, by planting new forests to be used for the wants and conveniences of men, if not in their day, after they are dead and gone to clay.

SUMMARY OF NEWS.

Pueblo is being canvassed for gas consumers. If enough are obtained, gas works will be constructed.

An unusual quantity of oil has been discharged from Canon City surface oil wells into Oil Creek.

The assessment roll for Denver foots up, in round numbers, \$10,000,000.

The internal revenue collected in Colorado during the year ending June 30th, reached \$89,593.55.

A fine brick school house is to be commenced immediately in South Pueblo.

Potatoes are set down as "almost a failure" in the crop report of the Big Thompson Valley.

Grace Greenwood has her residence at Maniton nearly completed. It is delightfully situated.

Work has been begun on the new School House at Colorado Springs.

The Episcopal seminary building at Canon City is growing rapidly.

A Boulder man has just completed a census of the town and finds that it foots up 1,038.

The Fairplay *Sentinel* reports a large number of tourists in that vicinity.

Five years ago the Methodists had only five preachers in Colorado. Now they have forty-eight.

A bank has been instituted in Trinidad by Messrs. Swallow & Terry.

There is a population of one thousand in Silver City, New Mexico.

The Pueblo *People* says that the ditch and the trees in South Pueblo, are something to be proud of.

A tannery in Greeley is doing a large business in curing buffalo robes. They are worth by the bale from \$9 to \$10 each, and cost, green, about \$1.75.

The Episcopal Church building at Colorado Springs will probably be the handsomest church structure west of the Missouri River.

Several hundred new buildings are in course of erection in Denver at the present time. As fast as they are finished others are started.

The Grand Lodge of Freemasons of Colorado will hold its annual communication in Denver, commencing on Tuesday, September 30.

Larimer County bids fair to be a heavy shipper of marble, as large quarries of that valuable material were recently brought to light.

Excellent salt has been discovered in the beds of some lakes, two hundred miles south of Cimmaron, on the prospective line of the Rio Grande Railroad. It is shoveled into wagons.

There is a report in circulation at Del Norte, Saguache County, that the Government is going to vacate Fort Garland and establish an extensive post fifteen miles above the former place, on the Rio Grande.

Mrs. Greatorex is preparing the matter and sketches for a work shortly to be issued by Messrs. Putnam, and to be entitled "Summer Etchings in Colorado." Most of the etchings will be of scenes in the neighborhood of Colorado Springs.

The total valuation of property in Pueblo County is \$3,105,191. The number of acres of improved land in the county is 130,115; and the number of cattle 26,772. Fremont County returns 52,242 acres of improved land; 17,836 head of cattle, and a total valuation of \$1,213,689.

The electors of the South Pueblo School District have instructed the School Board to build a public school house and furnish the same, authorizing an expenditure of \$2,256 for that purpose. The lot on which the building is to be erected was given by the Colorado Central Improvement Company.

The Pueblo *People* says: The town of Las Animas is at present one of the most flourishing in Colorado. Business is increasing, a great many strangers are seen upon the streets, and there is a healthy advance in real estate. The railroad prospects are brightening since the certainty of carrying the bonds has well-nigh assured the completion of the road into the town limits.

Professor Hayden writes that he and his party are in the grandest scenery in the world, and close to two of the highest peaks in the United States, which have been named Capitol and White-house. He says they have named the Great Range on the Upper Arkansas the National Range, as it is the largest in the United States. He says fifty peaks, each one 14,000 feet high, can be seen from where he writes.

A correspondent of the Denver *Tribune* writing from Fort Garland, under date of August 23rd, says: "A definite agreement has been reached by the Utes and the Government, through which the former agree to 'turn over,' at once and forever, all their claims upon the San Juan country—mines, towns, miners, stock and all. Most of the work that secured this happy result—the 'big talks,' smokes, management, manipulations, *et cetera*—has been the conduct of General Charles Adams, the indefatigable and efficient Indian Agent at Los Pinos. He had a valuable assistant in the celebrated Ute Chief—Gunny—who, for an 'Injun,' has about as 'big a heart' as the best even of the Anglo-Saxons. The agreement with the Utes only awaits the arrival of Messrs. Brunot (Commissioner of Indian affairs) and Bishop, from Washington, to be finally consummated and proclaimed."

Bishop Randall was lately in the Indian country, in Wyoming, and had a narrow escape from capture by the savages. On his return to Denver, a *News* reporter called upon the Bishop, who, in the course of the interview, gave utterance to the following opinion upon the course of the government, as regards the settlers and the Indians: "The faith of the government has been pledged to protect these Indians on the reservation, and it is equally in duty bound to protect the citizens who live there. And what are the forces for this purpose? In the reservation is one infantry company, and that not full; forty-six miles away is another company and a company of cavalry having little more than half the requisite number. These are all the forces who are to protect the people and operate against hostile Indians, who ride on fleet horses, who come suddenly, fight desperately, and, having murdered the people or stolen their property, escape rapidly. Such shameful neglect on the part of the government deserves, what we have no doubt it will receive, the just censure of all good citizens."

MINING INTELLIGENCE.

The "Cold Spring," in Sagar-Lough District, is producing ore worth \$6,000 per ton, and plenty of it at that.

The "Polar Star," on Democrat Mountain, is turning out ore that sells for \$1,300 per ton.

The bullion shipments from Central, for the month of July, through the banks alone, amounted to \$77,500.

Pueblo speaks of Smelting Works to accommodate the ores from Hardscrabble. Fairplay is also asking for smelters.

The Central Register says that the Bohtail Mining Company have been compelled to suspend work, owing to imperfect circulation of air through their smoke-stack.

A pocket of gold specimens was found in the Printer Boy lode, Lake County, last week, worth four thousand dollars.

The "Snowy Range" mining district, eight miles north of Caribou and one thousand feet higher, is attracting the attention of prospectors, rich silver veins having recently been discovered there.

The Pueblo *Chieftain* states that a company has been formed in that city with a capital stock of \$50,000, for the purpose of building a toll road to the San Juan mines.

The "Pelican" at Georgetown, is being worked night and day. The *Miner* reports eighty hands on the active list, and adds that the crevice averages seven feet and the pay streak about a foot.

The Canon City *Times* says that Messrs. I. & D. D. James have decided upon erecting Smelting Works at Rosita, (Hardscrabble District), immediately, and are advertising for four thousand bushels of charcoal per month, to be delivered at the works.

The Printer-Boy Company, in California Gulch, Lake County, with only fifteen stamps, has been extracting about \$3,000 per week. The capacity of the mill is to be increased by the addition of ten stamps.

The gulch miners of Summit County are much discouraged in their mining operations from the want of water. But little rain has fallen among the mountains of that region this summer, and, as a natural consequence, the streams, upon which the miners depend for the principal agent in gold digging, have been too weak for extensive development.

According to the *Mining Review*, the bullion product of Gilpin, Clear Creek, and Boulder counties, during April, May, and June was \$1,062,697.39. The product of the three counties during the half year was \$1,921,823.63. The increase of the second quarter over the first for the three counties was \$203,570.15.

The Black Hawk *Journal* says that the works at the Sierra Madre Tunnel, (of which enterprise we have already given some particulars to our readers), are rapidly approaching completion. The great wheel for supplying the tunnel with fresh air has been finished and is in working order, and everything goes rapidly on.

The Denver *News* says that separation works are now to be erected by Professor Hill at Black Hawk. The works are to be erected on the grounds of the Boston and Colorado Company. Professor Hill finds that he can refine his matte to better advantage, that is to say, less expensively, than to send it either to Germany or England.

Travel to the Del Norte and San Juan mines is greater at present than at any time during the season.

The people of Black Hawk are moving to secure an additional supply of water, as Clear Creek is found insufficient for mining and milling purposes. Mammoth Creek is to be carried down by a ditch and flume, at a cost not to exceed \$14,000.

The Fairplay *Sentinel* has reports from Mosquito, which state that the "Modoc," at twenty feet in depth, is five feet between walls. In the crevice are three or four streaks of mineral that vary from one inch to three inches in width, that have assayed as high as 1,500 ounces per ton. The "Spotted Tail" is also a very promising vein, and carries ore that has yielded, per assay, 1,800 ounces per ton.

A present there are about 500 miners in the San Juan District. They think they have there, says the Pueblo *People*, a silver and gold-producing district second in richness to none in the Territories. The owners of the Little Giant have erected and are operating a small quartz mill. A lot of ore from the Green Mountain lode, which ranks next to the Little Giant in richness, but is a gold-bearing vein, has yielded by careful assay at the rate of \$4,000 per ton. New discoveries are constantly being made.

The Pueblo *Chieftain*, writing of the San Juan District, says: Discoveries have been made 30 miles southeast of Del Norte, of a gold lode 30 to 40 feet in width, said to be equal in richness to the Little Giant. Many very large and fine looking lodes (in this same section) which were thought heretofore to be worthless, are now liable to prove to contain the very richest of ores. Prospectors are reported as having found placer mines about 30 miles north, from which they are taking out some very fine nuggets, one of which was valued at \$116. It was taken out last season. This district was first discovered three years ago.

A correspondent of the Colorado *Agriculturist* says: The depth at which mines "pay" is so various that no estimate can be formed. If the now famous Caribou mine had been commenced one hundred feet further east, it probably would not have even sold for three millions or any other sum. But as it was, the prospectors happened to sink on a "chimney," that is, the part of the mine which came near the surface, or the Caribou-to-day would be in the condition of a thousand deserted holes in the ground that future generations may prove to be good mines, but which the faint-hearted prospector has condemned to uselessness for a long time to come. It may be that at some great depth the mines of a district concentrate in one great deposit of mineral, but on the surface, the different districts seem to carry different kinds of minerals, or rather the precious metals are carried in different classes of rock and with different associations of minerals. For instance, Caribou, S. W. Sagar Loaf and Williamsburg carry silver almost exclusively, and as depth is attained, sulphurets of silver prevail to a great extent, and in S. W. Sagar Loaf, that richest of all forms of silver prevails almost from the surface, while near Williamsburg galena prevails to a great extent, and as you approach North-Eastern Four Mile Creek and Gold Hill, the telluride ores, rich in gold and silver, become more abundant, but so far as now known, prevalent in but few lodes.

AGRICULTURE, STOCK AND WOOL GROWING, ETC.

Some 30,000 head of Texas cattle are feeding in Bent County.

The harvest in Colorado is always later than in the States.

This year's crops have suffered on the Huerfano for want of water.

The wheat yield in the region round about Greeley will average near thirty-five bushels to the acre, in spite of the grasshopper raids.

The Colorado Springs Company have offered a number of valuable premiums for the best gardens and farms in and around Town, and the awarders have already made one or two visits of inspection. They are much gratified with the progress which has been made.

It is, says the *Denver Tribune*, becoming more and more evident every day that the section of country adjacent to the Rocky Mountains, is better adapted to dairying purposes than anything else, and it will not be long ere Colorado will be sending her butter and cheese East, instead of bringing it West.

Armijo Brothers, of New Mexico, have a flock of sheep numbering 250,000. They are divided into flocks of 3,000 and herded by a couple of men. The yield of wool is less than a pound and a quarter to the sheep, and still the business is very profitable.

A certificate of incorporation has been filed by the Colorado Live-Stock Company, capital \$300,000. The object of the corporation is the purchase, sale, breeding and rearing of cattle, horses, mules and sheep. The term of corporate existence is fixed at ten years, and the five trustees are, John W. Barron, James H. Jones, Joseph L. Bulver, Thomas G. Putnam, and Alfred Sayre. The office of the company will be in Denver, while pasturage for their stock will be obtained in Douglas and Greenwood counties.

The *Golden Transcript* says: The increase of population in the South Platte Valley will cut off an extensive range heretofore used by owners of Texas cattle, and will add largely to our yield of farm crops. We are every day growing out of this long-horn feeding business, as our lands are becoming too precious to be used as their pasture. Immigration is driving them from the Arkansas Valley, and the South Platte Valley will fail to furnish them with a feeding range by this time next year.

The Fair of the Colorado Industrial Association, successors of the Colorado Territorial Agricultural Society, will be held in Denver from September 30th to October 4th. The committee says: "Arrangements have been made for space at the Chicago Inter-State Industrial Exposition, which will run through the month of October, and all strictly Colorado products on exhibition will, at the close of the fair, with the consent of the owner, be taken to the Chicago Exposition. The great success attending the exhibition of Colorado products made at the St. Louis Fair, in 1870, will, it is hoped, induce every one having good specimens of Colorado's varied industries, to send the same for exhibition, enabling strangers visiting our own fair and visitors at the Chicago Exposition to form some idea of the immense material wealth and resources of our Territory. If one good specimen from each mine and crop in the Territory, be sent to the fair, it will make an exhibition unrivalled in any of the older States."

The Grange movement has traveled as far West as Colorado.

The Big Thompson Ditch Company is a new corporation, and proposes to run an irrigating canal from Greeley to Evans. This canal will cost \$40,000, will be twenty feet wide on the bottom, and will be finished in time for next year's crops.

The committee appointed by the irrigating convention in May, have determined upon Denver as the place for holding the general convention of the representatives from Western States and Territories on the 15th of October. Governor Elbert as chairman, has notified the Governors of the different States and Territories to that effect, at the same time requesting the most earnest cooperation. He has also extended invitations to Seneket Rhine, Senators Morton, Conkling, Wright, and other distinguished men.

The *Denver Times* gives the following as the state of the wool market: The wool market remained quiet with prices easy. Stocks continue meagre, with buyers scarce. In fact, the August dullness was kept up in the East, and the effect was felt here. By our next report we expect to chronicle a firmer market with more buyers on hand. The closing prices were: unwashed Colorado, fine, 13 to 15 cents; coarse, 11 to 13 cents; black, 9 to 11 cents; Colorado, fine selected, 18 to 21 cents; average grade, 16 to 18 cents; Mexican, average grade, 14 to 16 cents; black, 11 to 13 cents.

On another page we make reference to a meeting of the cattle-owners of Huerfano County, at which it was resolved to take steps to prevent the grazing of sheep on the public domain, on the ground that it is detrimental to the interests of the cattle-owners. Subsequently, a meeting of sheep-owners of the same county was held, when it was resolved to resist any such attempts by all legal means in their power; but that the cattle-owners should be invited to meet in convention and appoint a committee to meet a committee from the sheep-owners' convention, so as to agree upon a fair equitable basis of adjustment of the question in dispute.

The *Denver News* gives the following particulars concerning Mr. William A. Rand, of Ralston Creek, whom it puts forward as a specimen Colorado Farmer, and a conspicuous example of what energy and determination will accomplish on our soil: The year 1860 found Mr. R. in Colorado, attracted by the Pike's Peak excitement, and, in the following year, with a capital of less than six hundred dollars, he took up a farming claim in the valley of Ralston Creek. Perhaps, however, the most substantial part of his capital, was brought from Wisconsin in 1862, in the person of a devoted wife, who left the comforts of civilization, like many another, driving a team across the plains, while her husband drove and herded ten cows and calves, which were to help build up a home and a fortune at the base of the Rocky Mountains. Among the results of the labors of the last twelve years are a tract of fifteen hundred acres of fine farming land, nearly in a solid body, all of which will be "under ditch" in less than twelve months; a farm house costing five thousand dollars; twenty-seven dairy cows; nearly a hundred head of stock cattle; six teams,—horses and mules,—together with the usual tools and appliances for farming. Mr. Rand is one of the projectors and part owner of the Golden City and Arapahoe irrigating ditch, that will cover more than twenty thousand acres of land in Jefferson and Arapahoe counties.

RAILWAY INTELLIGENCE.

Iron is being laid at the rate of a mile and a half per day on the Arkansas Valley Branch of the Kansas Pacific.

Two new engines have been placed on the narrow gauge division of the Colorado Central, and they are working well.

The Trinidad *Enterprise* learns that the Atchison, Topeka & Santa Fe Railway will be graded no further in that direction this season.

The trial trip of the Fairlie Engine on the Denver and Rio Grande Railway, is to be made on an early day in the present month.

Bent County will vote, on the 9th of September, on a proposition to give the Arkansas Valley Railway Company \$100,000 in bonds, provided said railway builds to Las Animas and locates a depot there. The Government has given the right of way to said railway to build across the Fort Lyon reservation to that town.

The earnings of the Denver and Rio Grande Railway (Narrow Gauge) for the month of July amounted to \$39,300.53, being an increase of 37 per cent. over those of July last year; the net earnings were \$19,936.38 being more than 50 per cent. of the gross earnings, and an increase of 94 per cent. over those of the corresponding month last year.

The Denver and Rio Grande Railway Company is receiving a large amount of attention from Eastern newspapers. The fact is generally recognized that its marked success up to the present time demonstrates, beyond doubt, the economic value of the Narrow Gauge, all the theories of Broad-Gauge advocates to the contrary notwithstanding. The *Chicago Railway Review*, commenting on the fact that the net earnings for the month of June, amounted to 54 per cent of the gross receipts, says that such a proportion of net earnings would be deemed extraordinary on the best and longest established standard gauge roads in any part of the country.

LIFE AT MANITOU.—You drive on a mile through the garden and cross the foaming Fountain, and presently through the trees you see a long, white hotel. This is Manitou, named from a spring so called, the locality of the celebrated waters. The long verandah is crowded with loiterers, and there is a flutter of femininity upon the rustic bridges and winding paths. Beyond the house there is a huge boulder in the midst of the foaming stream, which serves as a pier for a slender bridge, and also beside it is the most pleasant and beautiful of these famous springs. This is "the fountain which boils," from which the stream takes its name. It is cold, but it seems to be scalding hot. It comes seething up in crystal purity, and you think there ought to be water enough to turn a mill. But the stream which trickles over the edge is small as it falls into the creek below. Even the wanderers over heated pavements are acquainted with its kind well enough. It is soda-water, lacking only the syrup. There was never a harmless thing so noisy as only a tumblerfull of it. It is pleasant to the taste, and the one just beyond it has still another recipe for its mixing, and is unlike it. There are six all told, each differing from the rest in temperature and taste, yet all close together. We are sight-seeing only, and will not enter into medical and chemical dissertations. It is well understood by old drinkers that Saratoga has a formidable rival here, and then that famous watering-place has not the solemn front of Pike's Peak beside it, nor Ute Pass, with its steep walls and deep gorge

and balsamic odors and foaming cascades, behind it. The visitor may think he will find frontiersmen and frontier life here, but he will be in some measure disappointed. The dashing young lady is here, ruining her complexion, kidded and flounced and pommaded, breking a heart now and then among the rocks, and staring at new-comers in the long dining-hall. Dandyism is here, with the painful poble in the same left eye. The broken-down editor is here, fuming around after the mails and daily papers as usual, and gaining rest and redness almost against nature and in spite of himself. You man with the mattoe-chop whickers is John Bull inevitably, and you hear him say to the waiter at tea: "Mush awa milk—aw, wat is that?" The little man with the ugly ventilating hat and an awfully bulbous nose is a Russian, you are told, and a savant. There is the young lady whom you saw yesterday in the deep recesses, and among the pines and feras of Cheyenne Canyon, and as she stood upon a boulder in mid-torrent and looked up, up at the snow-born flood which lay like a floating wall of lace against the rock, you heard her say, listringly, "This is finer than Montmorenci!"—with her white hand against too feet of sheer rock, and a dark pool at her feet, whose foam never knew sunlight.—*New York Tribune*.

PUEBLO.—We found Pueblo quite a different town from what we expected. It is one of the oldest places in the Territory, having been settled by the Mexicans, but never began to assume any importance until late years. The population of the place is composed of an adventurous, determined, energetic class of men, hailing from every nationality and clime, and you can hear upon its streets, French, Spanish, German, Mexican, English, pigeon English, Chinese and Ute gutturals; with its population composed of active Americans, sturdy Germans, swarthy Mexicans, embracing among the Americans, both classes in the late war.—Yanks and Rebels—making up a curious whole. The appearance of the buildings is no less peculiar, splendid iron front brick stores that rival Memphis, and the rude adobe buildings commingled; yet, there is a mysterious activity and energy about the people that is wonderful. The appearance of the entire part of Southern Colorado is like desolation to a native of our State, yet there is something in the climate and in the soil that proves such a conclusion false, and that there is no country in the States where people make money so rapidly as here, and where there is greater enterprise.—*Panola Star*.

ASTRID NOTIONS OF WESTERN SOCIETY.—It is not a little amusing to hear the oft-repeated apprehensions of uninitiated strangers as to the social status of the West—our city and Territory in particular. We have not infrequently heard, from those who *should* have been better informed, expressions of alarm as to their precious "corporations" during a brief visit to the city. Among their last acts on leaving the States is the purchase of a brace of Colt's navies and at least one of Bowie's brightest blades. A Sharp's carbine further contributes towards the completion of the military outfit, while their trunks and valises fairly groan with multitudinous packages of cartridges and "fixed ammunition." All these bellicose preparations in view of a hurried visit to Denver and the Rockies! Could absurdity further go? We question whether a quieter or more orderly community—one averaging a higher order of intelligence—or one in which there is less danger to life and limb, to insult or provocation—can be found than here. And the gentry who make walking arsenals of themselves and infernal machines of their luggage, in view of a western trip, only succeed in making themselves ridiculous and in putting themselves to a vast amount of expense and anxiety without rhyme or reason.—*Denver Tribune*.



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